U.S. ATLAS Software

WBS 2.2

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DOE-NSF Review of U.S. ATLAS Computing

Outline

❈ News from ATLAS & U.S. ATLAS
- ❑ International Manpower Situation
- ❑ Software MOU Status

❈ FY04
- ❑ Major milestones
- ❑ Current Allocation of Resources

❈ FY05 and Longer Term

❈ Support of U.S. ATLAS Physics Analysis Activities

❈ Conclusions

ATLAS Software Coordination News

❊ Overall Database Project Leader:

- ❑ (ATLAS) Organizational weakness identified in earlier DOE-NSF reviews. Forms a coherent set of plans and associated infrastructure across all areas of ATLAS project (Offline, TDAQ, Production, …)
- ❑ T. Wenaus (BNL) & R. Hawkings (CERN) names as co-leaders
  - ⌘ Findings of the search committee adopted by ATLAS management
- ❑ The U.S. needs to reassess its database priorities and plans in light of the new ATLAS Database Project Management.

❊ Analysis Tools Coordinator:

- ❑ Develop and deploy a framework and associated tools for analysis.
- ❑ K. Assamagan (BNL) named as coordinator of this group.

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Ongoing ATLAS activities

❊ Data Challenge 2:

- ❑ Software Release for Geant-4 simulation & Digitization certified.
  - ⌘ Production has just started
- ❑ Ongoing work on Reconstruction software
  - ⌘ Expected to be completed end of July

❊ Combined Test-Beam

- ❑ Major exercise with all sub-systems readout concurrently
- ❑ Major release of reconstruction software for Test-beam end of July

❊ The U.S. is playing a major role in both these exercises.

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Major milestones

Milestone	Baseline	Forecast	
POOL Integration	10-Sep-03	11-Sep-03	Completed
Geant-4 Validation for DC2 complete	31-Dec-03	17-Jan-04	Completed
Pile-Up support & Event Mixing	31-Dec-03	30-Mar-04	Completed
Software Release 8	27-Feb-04	31-Mar-04	Completed
DC2 Phase 1 (Simulation) starts	1-Apr-04	24-Jun-04	Delayed
Persistency of ATLAS Event data	1-Jun-04	31-Jul-04	Delayed
AOD-ESD-TAG data prototype definition	1-Jun-04	31-Jul-04	Delayed
Prototype Analysis Framework	15-Jun-04	15-Jun-04	Completed
Ready for Combined Test Beam	1-May-04	1-May-04	Partially completed
DC2 Phase 2 (Reconstruction) starts	1-Jun-04	16-Aug-04	Delayed
DC2 Phase 2 (Reconstruction) ends	31-Jul-04	15-Sep-04	Delayed
Prototype Schema Evolution	30-Sep-04	30-Sep-04	On Schedule
Software for Physics Workshop	15-Oct-04	15-Oct-04	On Schedule
Computing Model Paper	30-Nov-04	30-Nov-04	On Schedule
Computing MOU	31-Dec-04	15-Apr-05	On Schedule
Computing TDR	30-Jun-05	30-Jun-05	On Schedule
Software & Infrastructure for DC3	30-Sep-05	30-Sep-05	On Schedule
Physics Readiness Review	30-Jun-06	30-Jun-06	On Schedule
Cosmic Ray Commissioning	2-Oct-06	2-Oct-06	On Schedule

EDM (2.2.1.2) Milestones

Milestone	Baseline	Forecast	Status
Prototype Support for Composite, Bi-Directional Navigation	30-Sep-03	30-Mar-04	Completed
Prototype Support for Integer Keys	30-Sep-03	30-Sep-04	Delayed (See #1)
Support for Writing out Conditions Object on Demand	30-Sep-03	30-Mar-04	Completed (See #2)
Support for Persistent Inter-Object Relationships	30-Dec-03	30-Jun-04	Delayed (See #3)
Support for History Objects	30-Mar-04	30-Sep-04	Delayed (See #4)
Integrate CLID Database Generation	30-Jun-04	30-Jun-04	On Schedule
Integrate Data Store with Physics	30-Jun-04	30-Jun-04	On Schedule
Integration with POOL-Cache Manager	30-Jun-04	30-Jun-04	On Schedule
Data Objects Fully Accessible from	30-Sep-04	30-Sep-04	On Schedule
Support for History Objects	30-Sep-04	30-Sep-04	On Schedule

• All Level-4 milestones are reported and tracked accordingly;

• these are sub-set of ATLAS milestones where U.S. is playing a significant role

• Complete ATLAS software milestones maintained at CERN

International Manpower

❋ Insufficient people in ATLAS to work on core software

- ❑ Framework, Data Management, Infrastructure & Services
- ❑ LHCC Core Computing Manpower Review in Sept-2003 showed the need for additional 12 FTEs in the above areas.
  - ⌘ Reviewers suggested that 8 FTE would be sufficient if a nucleus of activity were to be established at CERN
- ❑ Threats issued to Collaboration:
- ❑ Gains since September 2003:
  - ⌘ 3.8 FTE from Israel, Mainz, UK, CERN, Taiwan
- ❑ Losses since then:
  - ⌘ 2 FTE in Infrastructure
- ❑ Expected:
  - ⌘ 2 FTE from Italy (LCG related), 0.5 FTE each from UK and MPI

International Manpower (2)

❋ ATLAS Software Librarian has finally arrived

- ❑ Hard to replace S. O'Neale who performed many tasks

❋ Currently short by 7 (3 if we assume the LHCC reviewer model)

- ❑ Short by four FTE in Infrastructure
- ❑ ATLAS Funds available for subsistence (4000 CHF/month) for working on software infrastructure and based at CERN.
  - ⌘ U.S. plans have additional infrastructure hire in FY07.
- ❑ Longer Term Funding?
  - ⌘ ATLAS Computing have realized that infrastructure tasks may be charged to M&O-A budget.
  - ⌘ Too late for FY05, Request for FY06 yet to be prepared.
  - ⌘ Put funds for 8 FTE (infrastructure work) in M&O-A budget and acknowledge existing work as an in-kind contribution
  - ⌘ Details being worked out.

ATLAS Software MOU

※ LCG MOU Task Force has been active for a few months
  - ❑ Covers computing facilities for all experiments, common middleware and application support
  - ❑ T. Akesson represents ATLAS interests in this task force
  - ❑ Draft by October to C-RRB, Final Draft for approval in April-2005.

※ ATLAS Software Agreements:
  - ❑ Framework (U.S.), CMT (Orsay), QA (Grenoble-UCL)

※ ATLAS Software MOUs
  - ❑ MOU dealt in a coordinated way among all four LHC experiments
    - ⌘ ATLAS must setup its own task force soon to detail its strategy.
  - ❑ Current priority is in establishing the LCG MOU
    - ⌘ Experiment based software MOU to follow.

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ATLAS Software MOU (2)

※ A discussion within ATLAS has just begun.
  - ❑ Implies setting up an "ATLAS Software & Computing Project" rather than the present "coordination body"
  - ❑ Manpower based MOU
  - ❑ Recognition to institutes and funding agencies for their contribution
  - ❑ Allows for concrete planning
  - ❑ Enables creation of common fund for "service tasks"

※ What to include in MOU?
  1) Infrastructure and Services
  2) Framework and Data Management
  3) Deployment and Production Tools
  4) Application frameworks (for simulation, reconstruction etc.)
  5) Detector specific software (simulation, calibration, alignment, reconstruction algorithms)
  6) Combined reconstruction algorithms

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U.S. ATLAS Software News

❋ New Level-3 box added: (WBS 2.2.6)
  ❑ Analysis Support Group (manager: H. Ma)
  ❑ More details later

❋ Closer integration with TDAQ software being addressed.
  ❑ Significant overlap necessitates closer coordination & planning
  ❑ Common Framework, infrastructure, algorithms, …

❋ New personnel on project funds in FY04
  ❑ Vakhtang Tsulai (Pittsburgh) : Detector Description
  ❑ Peter van Gemmeren (BNL) : Data Management
  ❑ Jack Cranshaw (ANL) : Data Management
  ❑ BNL mid-term hire : Not yet materialized

❋ U.S. personnel based at CERN:
  ❑ M. Marino, P. Nevski, D. Quarrie, V. Tsulai
  ❑ + several Non-Program funded people

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Prioritizations for FY04

❑ Continuing support for common Data Mgmt Software (2.2.3.2)
  ⌘ P. van Gemmeren replacing V. Fine at BNL

❑ Support for Event Store (2.2.3.3)
  ⌘ J. Cranshaw (ANL)

Decreasing Priority

❑ Detector Description support (2.2.2.3)
  ⌘ V. Tsulai (U. Pittsburgh) working with J. Boudreau, CERN based

❑ Analysis Tools Support (2.2.2.5)
  ⌘ Currently supported by PPDG funds

❑ Data Management increment at BNL (2.2.3.3)
  ⌘ Mid-Term Hire at BNL not yet materialized

❑ Others listed under FY05 priorities. However, we would benefit tremendously if support for them is available earlier in FY04, using any funding including management reserve. Current FY04 budget below guidance received from J. Shank ($ 2505k)

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FY04 allocation & FY05 minimal-effort

WBS	Description	FY04	LCG(04)	FY05	LCG(05)
2.2	**Software**	**12.95**	**3.5**	**15.4**	**4.9**
2.2.1	**Coordination**	**2**	**0.3**	**2**	**0.3**
2.2.1.1	Software Project	1	0.1	1	0.1
2.2.1.2	Data Management	1	0.2	1	0.2
2.2.2	**Core Services**	**5.3**	**1.8**	**6.9**	**2.5**
2.2.2.1	Framework	2.6	1.6	2.6	1.5
2.2.2.2	EDM Services	1.2	0.2	1.2	0.5
2.2.2.3	Det. Description	1		1	
2.2.2.4	Graphics	0		0	
2.2.2.5	Analysis Tools	0.3		1.9	0.5
2.2.2.6	Grid Integration	0.2		0.2	
2.2.3	**Data Management**	**4.15**	**1.3**	**5**	**2**
2.2.3.1	DB Services & Servers	0.4	0.2	0	0
2.2.3.2	Common Data Mgmt software	1		1.5	0.5
2.2.3.3	Event Store	1.15	0.1	1.5	
2.2.3.4	Non-Event Data Management	0.6		0.5	
2.2.3.5	Collections, Catalogs, Metadata	1	1	1.5	1.5
2.2.4	**Application Software**	**0.3**		**0.3**	
2.2.5	**Software Support**	**1.2**	**0.1**	**1.2**	**0.1**
2.2.6	**Analysis Support**	**0**	**0**	**0**	**0**

FTE by Institutions

FY04 FTE Distribution

WBS	ANL	BNL	LBNL	Pittsburgh	TOTAL
2.2.1	1	0	1	0	**2**
2.2.2	0	0.3	4	1	**5.3**
2.2.3	2.65	1.5	0	0	**4.15**
2.2.4	0	0.3	0	0	**0.3**
2.2.5	0	1.2	0	0	**1.2**
2.2.6	0	0	0	0	**0**
TOTAL	3.65	3.3	5	1	**12.95**

FY05 Minimal-Effort (support existing personnel incl. PPDG)

WBS	ANL	BNL	LBNL	Pittsburgh	TOTAL
2.2.1	1	0	1	0	**2**
2.2.2	0	1.9	4	1	**6.9**
2.2.3	3	2	0	0	**5**
2.2.4	0	0.3	0	0	**0.3**
2.2.5	0	1.2	0	0	**1.2**
2.2.6	0	0	0	0	**0**
TOTAL	4	5.4	5	1	**15.4**

FY05 Priorities

□ Support for existing FY04 personnel under Program Funds   `Model 0`
     ⌘ 13.8 FTE, $ 2723 k (in FY04$)

□ Support move of personnel from PPDG to Program funds   `Model 1`
     ⌘ 1.6 FTE (1 post-doc, 0.6 Adams)
     ⌘ Support for Distributed Analysis Tools

□ Increment University based Effort   `Model 2`
     ⌘ Proposal to add 1 FTE at U. Chicago, $ 150 k
     ⌘ Grid Integration aspects of Data Management
     ⌘ Closely work with Gardner (Chicago) + Malon (ANL)

□ Increment ANL Effort on Data Management   `Model 3`
     ⌘ Augment effort in Event Store and Collections Catalog, Metadata which is a primary U.S. responsibility.

□ Increment LBNL Effort on Framework   `Model 4`
     ⌘ Athena Framework Grid Integration

(Left margin: Decreasing Priority)

Job Descriptions for FY05 Requests

❋ **University Based Increment (Model 2):**

□ Work on Grid Integration of ATLAS Data Management software in support of distributed analysis; placed at a university where strong ties exist to U.S. ATLAS data management, grid, and physics analysis efforts.

❋ **ANL Increment (Model 3):**

□ Integration of POOL-developed collections and catalog software into the ATLAS offline infrastructure as part of the U.S. ATLAS event store effort, with particular attention to services and infrastructure needed to support grid-enabled distributed analysis. (.5 FTE in Event Store : WBS 2.2.2.4; 0.5 FTE in Collections, Catalogs, and Metadata : WBS 2.2.2.5).

❋ **LBNL Increment (Model 4):**

□ Coordinate with the grid middleware development team to identify and interface appropriate GRID interfaces to the application framework.
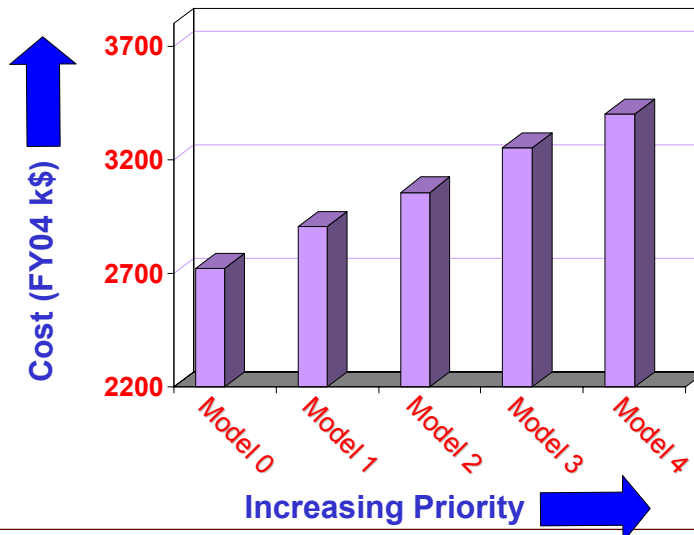
FY05 Prioritized Funding Requirement

Longer Term Planning

- ❊ **U.S. National Laboratories :**
  - ❑ Move remaining personnel from PPDG to Program funds at BNL
    - ⌘ No new personnel hires at any labs after FY05, provided FY05 requested funds are available
  - ❑ Add 1 person at BNL in FY07 for software support
   - ⌘ Currently at 1 FTE (Alex Undrus : U.S. ATLAS Librarian)
- ❊ **U.S. Universities :**
  - ❑ Increment effort at university by approximately 2/year to total of 7.
  - ❑ Initially involved in support of core activities such as Detector Description, Grid Integration, sub-system database support, Analysis Tools.
  - ❑ Helping U.S. physicists design, develop and integrating their application software with ATLAS architectural tools.
  - ❑ Eventually leading in playing a crucial role in establishing a working and validated software as beam turn-on approaches.

Long Term FTE Allocation
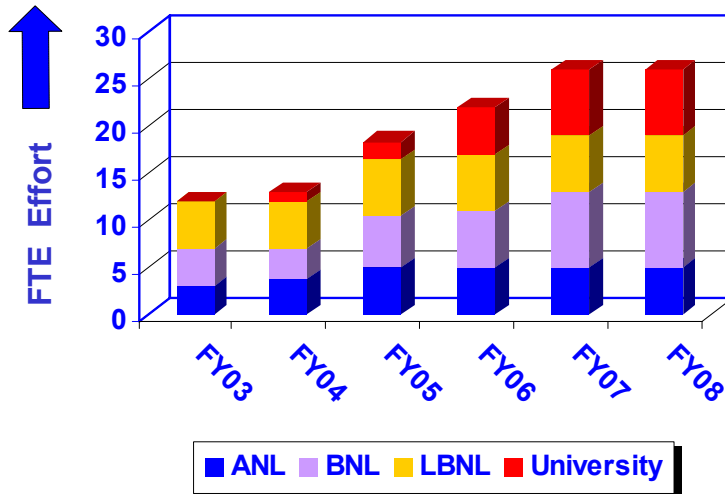
Long Term Funding Projections
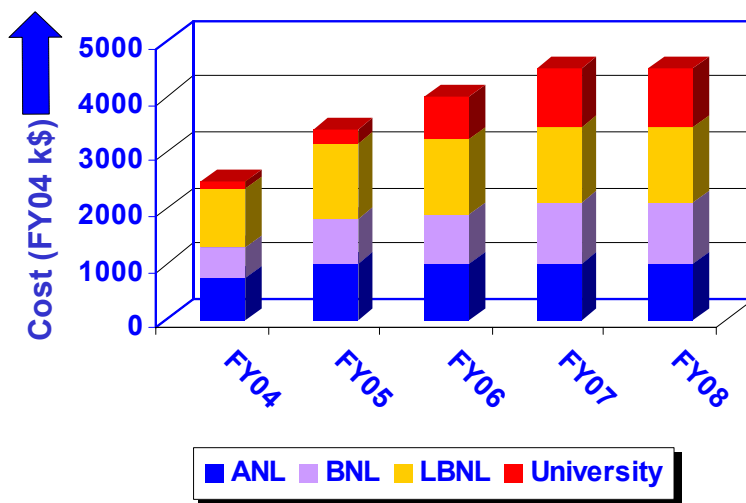
FY04 Application Software FTE Effort (Base Program Supported, Jan-2004)

Institute	2.2.4.0 Coordination	2.2.4.1 Simulation	2.2.4.2 Subsystem Reco	2.2.4.3 Combined Reco	2.2.4.4 Analysis	2.2.4.5 Trigger	2.2.4.6 TestBeam	Total
Arizona	0.20	0.10	0.20	0.40	0.20	0.00	0.55	**1.65**
BNL	1.10	0.70	0.40	1.10	0.80	0.20	0.30	**4.60**
Boston	0.15	0.00	0.00	0.00	0.00	0.00	0.00	**0.15**
Chicago	0.80	0.20	0.40	0.70	0.00	0.00	0.25	**2.35**
Harvard	0.05	0.30	0.20	0.00	0.10	0.00	0.00	**0.65**
Indiana	0.20	0.10	0.10	0.00	0.00	0.00	0.10	**0.50**
LBNL	0.40	0.50	0.00	0.20	0.50	0.00	0.00	**1.60**
Michigan	0.70	0.45	0.45	0.00	0.90	0.00	0.40	**2.90**
MSU	0.00	0.00	0.00	0.00	0.00	0.70	0.00	**0.70**
Nevis	0.30	0.80	0.00	0.10	0.00	0.00	0.50	**1.70**
Pittsburgh	0.00	0.00	0.30	0.00	0.00	0.00	0.00	**0.30**
SMU	0.00	0.00	0.50	0.30	0.70	0.00	0.10	**1.60**
Stony Brook	0.00	0.00	0.00	0.00	0.30	0.00	1.00	**1.30**
UTA	0.00	0.00	0.00	0.00	0.10	0.00	0.00	**0.10**
Wisconsin	0.30	0.00	0.05	0.05	0.00	1.60	0.00	**2.00**
Total	**4.20**	**3.15**	**2.60**	**2.85**	**3.60**	**2.50**	**3.20**	**22.10**

Model to get US ATLAS Physicists involved in Analysis

❋ Requirements:
- ❑ Support Students/Post-Docs to carry out their analysis in U.S. should they choose to.
- ❑ Support Students and Post-Docs during their presence at CERN (permanent or visits)
- ❑ Support senior U.S. physicists (professor types) who are unable to travel frequently to remain associated with physics analysis.

❋ Goal:
- ❑ Ensure that U.S. physicists are actively involved in ATLAS physics analysis and gain visibility, recognition and leadership roles in physics groups
- ❑ Immediate short term goal: Ensure that U.S. participates effectively in ATLAS 2005 Physics Workshop.

Analysis Support Group (ASG)

❋ First steps to implement this working model has been taken by establishing the Analysis Support Group

❋ Puts together U.S. physicists experienced with software and analysis

❋ Software Level 3 box (WBS 2.2.6)

- ❑ Manager : Hong Ma (BNL)
- ❑ Others in group:
  - ⌘ D. Costanzo, I. Hinchliffe (LBNL)
  - ⌘ F. Paige, S. Rajagopalan (BNL)
  - ⌘ P. Loch (Arizona), F. Luehring (Indiana)
  - ⌘ F. Merritt (Chicago), J. Shank (Boston)
- ❑ Membership will evolve as other U.S. physicists gain experience with time to take over this responsibility.

Reponsibilities of ASG include:

1. Provide up-to-date information on sub-detector and software components. Maintain up-to-date analysis web pages.
2. Provide analysis software tutorials
3. Identify existing (or the lack of) expertise within U.S. ATLAS, establish a network of support.
4. Work with the U.S. physicists to resolve software, detector or physics problems encountered in their analyses.
5. Facilitate communications by holding regular meetings and providing a forum for technical discussions
6. Hosting visitors and visiting U.S. institutions for informal discussions
7. Develop and follow-up analysis plans with U.S. institutes. Assign an ASG member to follow closely with specific analysis activity.
8. Provide advisory role for students and post-docs.
9. ASG also has presence at CERN to provide support to U.S. activities.
10. ASG communicates effectively to make analysis in US a success.

An Example

❋ A University has a student, post-doc and an advisor:
- ❑ Student and Post-Docs would be welcome to come to BNL (or other institutes) to learn how to use software and do analysis.
- ❑ Student and Post-Docs can discuss and develop their detailed analysis plans with ASG.
- ❑ ASG will follow-up and help in establishing their analysis plans together with the relevant ATLAS physics groups.

❋ ASG member closely follow this analysis activity helping student & post-doc at each stage.

❋ Provide a forum (bi-weekly meetings) for discussion of their analysis.

❋ Continue to provide support when they travel to CERN.

❋ Help establish their role in ATLAS physics activities.

Responsibility

❋ BNL, as the Host Laboratory and U.S. ATLAS Tier1 Center, has a responsibility to organize and implement this model.

- ❑ With help from other excellent U.S. physicists at Universities and Laboratories
- ❑ This model has started : Detail at:
  - ❈ http://www.usatlas.bnl.gov/atlas_psc/software/support/

❋ This model is not meant to force U.S. physicists into a certain style of working or add bureaucratic layers, but an attempt to help those in need.

Conclusion
Response to January recommendations

❋ Consequences of funding shortfall (do whatever we can to ramp-up personnel)
  ❑ Software priorities well established

❋ Provide full support for at least two platforms
  ❑ Porting to MAC-OS underway + support for 64-bit architecture

❋ Existing QA should be fully executed. Code Reviews
  ❑ Code Reviews for many components planned later this year

❋ ATLAS and US management should resolve database management problems
  ❑ ATLAS Overall Database Project Leader has been appointed

❋ U.S. should plan for greater user support load (emphasis on CTB)
  ❑ Analysis Support Group formed to help and encourage U.S. physicists

❋ U.S. to resolve HLT/Offline mgmt, finding way to manage project centrally
  ❑ Work in progress to resolve this issue.

❋ U.S. is encouraged for continued involvement in ARDA/LCG
  ❑ D. Adams playing a leading role. (Current U.S. effort supported under PPDG)